EINSTEIN'S THEORY

A SERIES OF LETTERS TO
"THE TIMES OF INDIA"

BY

G. E. SUTCLIFFE

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PREFACE

THIS pamphlet is a reprint of correspondence on Einstein's Theory which appeared in *The Times of India* during the latter half of 1921. It is an attempt to throw light on the theory of Relativity, and that of Einstein, by observations and teachings of an Eastern School of Philosophy and Science, the existence of which is not generally known, and deals with aspects of the question which, as far as I know, have not appeared elsewhere.

It may perhaps interest a few students, both in the East and the West.

Shahpur, Ahmedabad, India.

G. E. SUTCLIFFE

January 16th, 1922.

" The Times of India," Friday, June 24th, 1921

EINSTEIN'S THEORY

I. AN INDIAN ALTERNATIVE

SIR,

I doubt if many of your readers are aware that a scientific philosophy, which has its home and origin in India, puts forth an alternative theory to that of Einstein, and one which explains the same facts without burdening us with Einstein's brain-bewildering deductions. Before attempting to put forth this alternative theory, I will first give two proofs of its efficacy in discovering new scientific facts. At the meeting of the British Association in 1913, F. W. Aston announced the discovery of a new chemical element of atomic weight 22, to which he gave the name of Meta-neon, an account of which is given in Prof. Soddy's *Chemistry of the Radio-elements* (Part 2, p. 35), published in 1914. On June 3rd, 1920, Prof. Rutherford announced to the Royal Society the discovery of another new element of atomic weight 3, an account of which will be found in *Nature* of June 17, 1920 (p. 501).

In the year 1908, two students in this Indian school of philosophy, Mrs. Annie Besant and Mr. C. W. Leadbeater, published a book called *Occult Chemistry*, which purported to be an investigation of the chemical elements by a method taught in that school. These investigations agree with those of the chemist, with the significant exception that they announce the discovery of several new elements which do not appear in chemical tables. In their list of elements (*Occult Chemistry*, First Edition, 1908, p. 4) they mark these new elements by an asterisk. To one of these new elements they give the name of Meta-neon, and state that its atomic weight is 22, whilst to another of these new elements of atomic weight 3, they give the name " Occultum ".

To summarise the above, we have the following incontestible fact, which your readers can easily verify, that two students of Indian philosophy, using methods of research unknown to Western science, announced in 1908 the discovery of two new chemical elements—Meta-neon, atomic weight 22, and Occultum, atomic weight 3. In 1913, or five years later, F. W. Aston announced to the British Association the discovery of the same element of atomic weight 22, and gave it the same name—Meta-neon—that had been given to it five years earlier by the Eastern students. In 1920, or 12 years later, Prof. Rutherford announces to the Royal Society the discovery of the second element of atomic weight 3, which has not

yet been named, but which, by the rules of scientific procedure, which accords the right of naming to the original discoverers, we are entitled to call " Occultum ".

Such is the letter of credit which I present to your readers on behalf of the rival philosophy to that of Einstein. If some of them are inclined to object that two facts constitute a structure too slender on which to build a philosophy comparable to that of Einstein, I would reply that the philosophy of Einstein is so far based on two facts, and two facts only—the bending of rays of light by the sun's gravity, and the motion of the perihelion of Mercury.

Having thus established the equality of the two philosophies, as to the basis on fact, we may now compare the deductions from the rival theories. First of all, we may note a point of agreement: both philosophies regard the universe as a four-dimensional manifold of which our three-dimensional space is a section. Previous to Einstein, four-dimensional space was regarded as an interesting mathematical fiction, without any physical significance, whilst Einstein has compelled us to regard it as a physical reality. The Eastern philosophy has always laid stress on the reality of space of higher dimensions. One of the main differences is that Einstein's philosophy disturbs the foundations of Newtonian mechanics, on which the physical sciences

are based, whilst the Eastern philosophy leaves them intact.

The famous experiment which has given rise to the philosophy of Einstein, is what is known as the Michelson-Morley experiment. The theory which prevailed in the nineteenth century was that the universe was filled with a single ether, which was constant and stationary, and in this ether light travelled with a velocity of 300,000 kilometres per second. Now the earth, in its orbit around the sun, moves with a velocity of 30 kilometres per second; so that it was argued that a light ray moving in the same direction as the earth would have a velocity relative to the earth of 300,000 minus thirty, whilst in the opposite direction this velocity would be 300,000 plus thirty. Messrs. Michelson and Morley devised an experiment to test this, when—lo and behold!—they were able to prove that the velocity of light was exactly 300,000 kilometres in whichever direction it was propagated. For a time physicists were staggered, until Prof. Lorentz devised a theory to account for it. He said that if a rod, 300,000 kilometres long, was pointed in the direction in which the earth is moving, it will become 30 kilometres shorter; whilst, if it is pointed in the opposite direction, it will become 30 kilometres longer. Hence, although the velocity of light is actually shorter and longer in the two cases, nevertheless we cannot detect it, because our measuring rod changes

in length to exactly the same extent. This change in the measuring rod is known as the Lorenz-Fitz-Gerald contraction. Now the Einstein theory is a further development along the same lines. According to Einstein not only does our unit of length change, but our unit of time also. Hence we have no means of measuring with certainty either a length or a time.

Let us compare the above with the teachings of Indian philosophy. According to this, it is not true that there is one ether of space which is constant throughout the universe, but the earth and the heavenly bodies have each their own ether, which extends throughout space, and which is attached to and moves along with it. The velocity of radiation is a property peculiar to each of these individual ethers, and is always a constant in relation to the body to which that ether belongs. The Michelson-Morley experiment, therefore, was exactly in accord with the theory of the Eastern school, and there is no need either for the Lorenz-FitzGerald contraction or the theory of Einstein to account for it.

Dr. R. A. Houston of the University of Glasgow, in an article in the leading scientific monthly, *The Philosophical Magazine*, for February, 1919 (p. 214), propounds this theory of the ether being attached to the earth, and demonstrates that it not only accounts for the aberration of light, but also explains the Michelson-Morley experiment, and renders

unnecessary the principle of *Relativity*, out of which the philosophy of Einstein has been developed.

In a later communication I hope to give good grounds for the contention that another of the fundamental assumptions of Einstein is not only unjustifiable, but positively erroneous.

G. E. SUTCLIFFE

"The Times of India," Saturday, July 23rd, 1921

II. AN EASTERN VIEW

SIR,

One of the merits of the theory of Einstein, which will ultimately be recognised, is that it goes far to construct a bridge between scientific theories of the West and those of the East. Hitherto between these two schools of thought a great gulf was fixed, which prevented the teachings of the East from being investigated by the West. I hope to show in the course of these communications that the theory of Einstein is a plank by means of which that gulf can be crossed. Some years ago I endeavoured to show in your columns that meteorological phenomena, and our monsoon variations in particular, had a relation to planetary configurations, and that this relation was one of cause and effect. This attempt was suspended for a time because it became obvious

to me that, until the gap could be leaped between the teachings of East and West, it would be impossible to induce men of science in the West to enquire into the matter, for, according to the prevailing Western theories, it was quite impossible that the planets could produce any perceptible effect on our weather, and any Western scientist of repute, who ventured to enquire into the question, would immediately lose his reputation for sanity and common sense. I therefore turned my investigations in the direction of finding a bridge between the two schools of thought, and have completed six typewritten volumes of mathematical researches with this object in view. Altogether there are about 2,000 quarto pages and 10,000 equations. In my opinion the bridge has been found, and in finding it I have been greatly assisted by the recent work of Western physicists such as Prof. J. J. Thomson, but most of all by that of Einstein.

At the outset, therefore, I would like to make it clear that I do not disbelieve the theory of Einstein. I accept the deductions from his theory as mostly true, but in some cases I interpret those deductions differently. The main object of these communications is to indicate, in language "understanded of the people," the nature of the bridge between two important schools of thought, and if possible to bring about co-operation between them.

In carrying out this object, I may occasionally have to use illustrations that are not strictly true

mathematically, although the principle illustrated will be true. In your issue of June 24th, such an expedient was resorted to in connection with the Michelson-Morley experiment. The conclusions drawn by scientific men from that experiment were that it is impossible by any experiment to detect any motion relative to the ether of space, because the length of the measuring rod varies in such a way as just to hide the relative motion. This is the principle I tried to illustrate in my last letter by a method in which the mathematician will detect an error, but the illustration given in works for mathematicians, and which of course is the true one, would have been unsuitable for your columns, but may be read in Eddington's *Space, Time and Gravitation* (p. 17). The conclusion drawn from it is the same in every respect as the conclusion drawn from my mathematically incorrect illustration.

It was shown in my last letter that the result of the Michelson-Morley experiment was exactly what must be expected from the Eastern theory, that the earth carries about its own ether, whilst the result is the unexpected on the Western theory, and requires the theory of relativity to explain it. To this the relativist will probably answer that the FitzGerald-Lorentz contraction is based also on the motions of an electron through the ether, and not entirely on the experiment of Michelson-Morley. But the Eastern student can reply that, in so far as the

theory of relativity is based on the motion of the electron through the ether, there is no objection to it, because in this case there is actual motion relative to the ether both on the Western and Eastern theories, so that this property of an electron does not discriminate between the two, but follows equally from each. We must therefore turn to where the two theories predict different results, and compare these results with observation.

This brings us to one of the most important and fundamental differences between the teachings of the two schools of thought.

The Western school says the velocity of light is a constant throughout the universe : the Eastern school denies this.

Now this one proposition about the constancy of the velocity of light is the one fundamental assumption on which the philosophy of Einstein is based, and by Western physicists it is regarded as perhaps the most perfectly proved fact in science. All the available evidence is in favour of its truth, and the evidence is abundant, yet the Eastern student denies it point blank.

Let us first consider the evidence in favour. The velocity of light can be directly measured in our laboratories. We have measured it also in its passage from the planet Jupiter to the earth. It enters into our system of electrical measurement, and always gives us correct results. By means of it we measure

correctly the masses and motions of distant stars, showing that this velocity remains constant from the earth to the most distant stars. In Western circles, if anyone ventured to deny so obvious a deduction as that the velocity of light was constant, his denial would probably be received with hilarious laughter. Nevertheless the Eastern student, knowing and having carefully weighed the abundant evidence in its favour, will venture to deny its truth.

The grounds of his objection would be briefly as follows. In all experiments in which the velocity of light has been measured, the earth has occupied either one end of the line or both. When the velocity has been measured on the earth's surface, the earth has held both ends of the line, when it has been measured from Jupiter to the earth, the earth held one end of the line. Similarly with the velocity of light between the earth and distant stars, the earth has always been at one end of the line. The Eastern student would therefore say that the experiments you have tried only entitle you to conclude that the velocity of light is a constant when the earth holds one or both ends of the line; it does not entitle you to say that light between the sun and Jupiter or Mars, or between the stars and the planets, travels with the same velocity. For light received by the earth reaches it through its own domestic ether, which extends to the stars; the velocity of light therefore may be a property of the

terrestrial ether, and it can be shown to be a simple function of the earth's mass and gravity. This simple function does not apply to the other heavenly bodies which, according to the Eastern school, have each their own etheric medium extending throughout space, and having a radiation velocity definitely related to the mass and position of the planet, just as the velocity of light observed on the earth has a definite relation to the mass and position of the earth in the solar system.

The proofs of the above need to be reserved for a later communication, but it may be here pointed out that the value of Einstein's theory is that it provides substantial proofs of the above proposition.

G. E. SUTCLIFFE

"The Times of India," Friday, August 12th, 1921

III. AN EASTERN VIEW

SIR,

One of the most astonishing deductions from the theory of Einstein is that there is a maximum mass of matter for any body in the universe, the particulars of which are given by Prof. Eddington, in his report to the Physical Society on the relativity theory of gravitation (p. 75), and in his *Space, Time and Gravitation* (p. 148). It is the mass of a sphere of water

567,880,000 kilometres in radius. According to Einstein such a body would be coextensive with space. As Eddington puts it, "there could not be any other world anywhere else, because there isn't an 'anywhere else'". Yet if this body had its centre at the sun, it would not extend to the orbit of Jupiter. Nevertheless there would be no space outside it. This absurdity I propose to show is due to the false assumption which I dealt with in my letter of July 23rd, *viz.*, that the velocity of light is a constant of the universe, whereas it is only a constant of the earth's electromagnetic field. I shall prove this by showing that this maximum mass of Einstein is purely and simply the electric charge of the earth, and has no connection whatever with any other body.

The mass of the above sphere of water, expressed in grammes, is a number consisting of 42 figures; the first five being 76,717, and the rest ciphers. Let us now compare this with the earth's electric charge, which recent developments in science enable us to calculate. According to the theory of Rutherford, now generally accepted, the positive electric charge on the nucleus of an atom is a definite number of electric charges, each equal to the charge on an electron, or an atom of hydrogen. The number of these charges on any element is the atomic number of the element, and these atomic numbers are serial numbers in the order of the atomic weights, beginning with Hydrogen 1, Helium 2, up to Uranium 92, so

that the charge on each element is perfectly well known, and the mass of the element can be also calculated from its atomic weight. By dividing the charge by the mass, we obtain the ratio of charge to mass for each of the chemical elements. In the case of Iron the charge in electrostatic units is 134,780,000,000,000 times its mass; if therefore the earth consisted entirely of Iron, the electric charge of the earth would be the earth's mass in grammes multiplied by the above number. This would give a number of 42 figures like the maximum mass of Einstein, the first five figures being 80,601, and the rest ciphers. This is not greatly different from Einstein's figures—76,717. If the earth consisted of other elements, the charge would be different, but not greatly so. For Copper it would be 79,153, for Zinc 79,444, for Silver 75,419, for Arsenic 76,208, and for Tin 72,919; the average value of the above six elements being 77,291, which differs very slightly from Einstein's mass. If we take the entire system of elements from Hydrogen to Uranium, and average them, the earth's charge would be 76,567, as against 76,717 for Einstein's mass, a difference which is not greater than the experimental errors, so that we have here a definite proof that Einstein's maximum mass is numerically identical with the earth's electric charge.

If we took the planet Mars or Jupiter, or any other of the heavenly bodies, and calculated the electric charge, we should obtain a number quite different

from Einstein's mass, so that this mass is definitely related to our earth and only to our earth; it is therefore a constant of the earth's electromagnetic field, and not a universal constant of space as deduced by Einstein. The limitation of space, therefore, above referred to, is only the limitation of the outreach into space of the earth's electromagnetic field, and all the absurdity of his proposition, that the world is both finite and unlimited, vanishes.

It remains to point out that Einstein's mass is calculated from the velocity of light, and his conclusion that this mass is a constant of the universe is based entirely on the assumption that the velocity of light is a universal constant; when, therefore, it is shown that this constant applies only to the electromagnetic field of the earth, it carries with it the proof that the velocity of light is only a constant of the earth's electromagnetic field.

It would be possible to strengthen the above conclusion by much other evidence, did space permit, but one further proof will perhaps suffice. Prof. Eddington has remarked (*Space, Time and Gravitation*, p. 163) that some mechanism seems to be needed whereby gravitation creates matter, and according to the Eastern school this is exactly what gravitation is doing. The atom of matter is continually changing its constituent parts, and is only constant in the sense that a lake is constant in which the outflow and inflow of water are equal. This process takes place

in the auroral regions of the atmosphere at a height of 66 miles above the earth's surface, where the acceleration of gravity has the value 950·32 centimetres per second. The process of changing the constituents of the matter of which the earth is composed, completes itself each time the earth completes a revolution round the sun, or one siderial year, in which time the acceleration of gravity generates a velocity exactly equal to the velocity of light. This is easily demonstrated, for the number of seconds in a year is 31,558,000, and this number multiplied by 590·32 gives 29,990,000,000, which is exactly the velocity of light in centimetres. We thus see that the earth's surface gravity, its orbital period, and the velocity of light, are interlinked phenomena, in a way that is unique within the solar system, for the product of the surface gravity and the orbital period of any other planet gives a velocity which is entirely different.

In conclusion I wish again to emphasise the fact that the demonstration that the velocity of light is not a universal constant disproves the fundamental assumption on which the theory of relativity and the theory of Einstein are based, as far as these apply to cosmic space, though these theories remain intact for the earth's electromagnetic field. This field embraces a sphere of about 100,000,000 light-years in diameter, which agrees with Einstein's estimate of the limits of space. It can be calculated from the earth's electric

charge, by the same formula as that used by Sir J. J. Thomson to calculate the diameter of an electron.

I would further point out that this limitation of Einstein's theory will not diminish, but on the contrary greatly enhance, its utility and importance. It will do for astronomy what Faraday did for electricity. It will change it from an academic science into a science harnessed for the service of man. It gives us the long-sought-for connection between the forces of gravity and electricity ; for each of the heavenly bodies, like the earth, must have its own electromagnetic field, so that space is filled with a network of lines of force, intersecting each other in different ways from day to day, according to the changing planetary configurations.

Just as the armature of a dynamo, by cutting lines of force between the poles of a magnet, generates electrical forces, so these lines of force from the heavenly bodies are cut in varying quantity from day to day, thus producing varying forces operating upon the earth's atmosphere, which determine meteorological changes and the course of the Indian monsoon. It is only by a careful research into the intersecting network of the terrestrial and planetary electromagnetic fields, that the problems of forecasting successfully the Indian monsoon can be solved ; and one of the keys to this problem is the theory of Einstein.

G. E. SUTCLIFFE.

" The Times of India," Wednesday, September 7th, 1921.

IV. REPLY TO MR. SUTCLIFFE

SIR,

Mr. Sutcliffe's contributions on the above subject are not so clear as they are interesting, and he must forgive me if I ask him a good many questions. He belongs to what he terms " the Eastern School of thought ". I never even suspected the existence of an Eastern (as opposed to the Western) physical and mathematical science, but Mr. Sutcliffe's reference to the influence of heavenly bodies on the weather leads me to think that by it he means " Astrology ". I should like to be enlightened on this point first of all.

I intend here to deal with Mr. Sutcliffe's second letter only. Frankly, I do not understand his third letter at all. What he formerly called " ether," he now calls " magnetic field," a most deplorable confusion of terms which would by itself justify a critic in dismissing such apparently scientific stuff as worthless. As, however, we are all in search of truth, I desire to see clear in Mr. Sutcliffe's tangle.

Mr. Sutcliffe's aim in writing to the Press is to reconcile two different (I should rather say contradictory) views of the universe, in a language " understanded of the people," and for this purpose he

ventures to give illustrations that are, by his own showing mathematically false. This is a highly objectionable process ; for the average reader must be bewildered, while the scientifically trained reader will stop reading at once. As a matter of fact. some subjects are utterly beyond the comprehension of the public at large. who must accept the conclusions arrived at by scientists, so there is nothing to be gained by attempting to make abstruse truths clear by means of incorrect language. Mr. Sutcliffe need not fear to resort to technical language; our old friend *The Times of India*. which is so advanced as to open its columns wide to technical articles on art, will no doubt extend its hospitality to science ; and, though Mr. Sutcliffe's 2,000 quarto pages and 10,000 equations may well make the most heroic mathematician pause, a small portion of these would be welcome, enough to show on what axioms he bases his theory, and by what process of calculus he reaches his conclusions. To the average reader the word "equation" sounds as convincing as it is mysterious, but the trained mathematician knows what errors may be found at the end of a perfectly correct chain of formulæ, if there is a flaw in the premises. I still remember the laugh I had in my student days over a bulky volume which claimed to have solved the three insoluble problems of elementary geometry. I do not mean to cast suspicion on Mr. Sutcliffe's equations, I merely want to see some of them.

On the physical side of the question Mr. Sutcliffe is fortunately sufficiently explicit to permit the opening of a discussion. He asserts:

(1) that the Earth carries with it its own domestic ether, which extends to the stars;

(2) that each heavenly body has its own etheric medium extending throughout space;

(3) that the velocity of light is a function of the mass, gravity and position of each body; from which he draws the conclusion that the proof of the constancy of the velocity of light throughout the universe (accepted by Western science) is, so to say, *ultra vires*, and ought to be accepted only with reference to the incidence of light between the Earth and the universe, not between two points of the universe which are both outside the Earth.

I must complain of the looseness of Mr. Sutcliffe's language; for he asserts that the Earth's ether extends "to the stars," while that of other bodies extends "throughout space". I suppose he means the same thing, that is, that each ether extends to the infinite, but the phrase "to the stars" is badly chosen, as some stars are our next-door neighbours, while others are at a distance that defies all measurements.

Now it is hardly necessary to remind even a young student that the ether is not a "reality" but a "hypothesis," not a fact but a deduction. Its properties are "assumptions," accepted as long as they account for all known facts, but liable to be rejected

or modified as soon as a single new fact appears with which they cannot be reconciled. The properties of the ether have been deduced by observations made on Earth; and, so far, the generalisation that they characterise the ether throughout the universe has been justified. What grounds has Mr. Sutcliffe for asserting that they vary, indeed that they are definite functions of the mass, gravity, and position of each heavenly body? His 10,000 equations are of no use here; he must demonstrate his facts physically, that is, by direct observation; and so long as he cannot transport himself to another planet, I fail to see how he can do so. As a preliminary, however, I would ask him to say what he means by making the velocity of light a function of position. Does the velocity of light vary with the moving of a body? Such a notion, being, to say the least, novel, requires elucidation. What function is velocity of position? It must be a periodical function, since a non-periodical function would have for limit nought or the infinite, which means that in extreme cases the velocity of light would be either infinitesimal or infinitely great; it must furthermore be a function of the relative position of two bodies, since their *absolute* motions are unknown. This function ought, moreover, to be periodical, both when the relation of position is periodical, as is the case of the planets of a solar system, and when it is not, as is the case of comets with parabolic or hyperbolic orbits. It would interest me

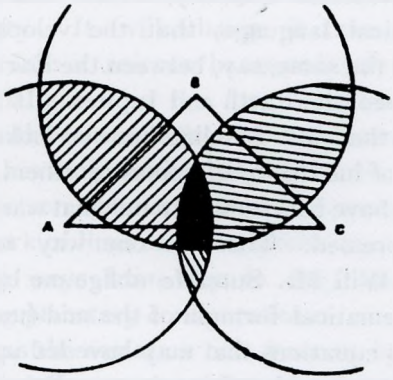
enormously to see the form of a function that remains periodical both for periodical and non-periodical variations of the variable quantities.

Pushing our analysis still further, the function ought to acquire different values for every variation of each variable quantity, which means, in non-mathematical language, that the velocity of light cannot be the same, say, between the Earth and Mars and between the Earth and Jupiter. Is this a fact? It seems that Mr. Sutcliffe has overlooked this consequence of his theory of domestic ethers. But, after all, I may have badly understood what was confessedly badly expressed. There is one way to clear the ground. Will Mr. Sutcliffe oblige me by publishing the mathematical formula of the said function? Not the 10,000 equations that may have led up to it; just the final result and nothing more. Proofs may wait.

Turning now from the mathematical to the physical aspect of the problem. I wish to ask Mr. Sutcliffe some very pertinent questions. To simplify matters, let us admit the existence of only three heavenly bodies, A, B, C. Each, according to him, has its own ether extending throughout space. This would give rise to three functions. Expressing mass by m, gravity by g, and position by p, the velocity of light between the three bodies would respectively be expressed by

$$F_{AB}(m.g.p.)\,;\quad F_{AC}(m.g.p.)\,;\quad F_{BC}(m.g.p.)$$

But here a difficulty arises. Since the three ethers extend, by definition, throughout space, they must compenetrate each other. This will be made clearer by a diagram in which the ethers are assumed to be limited :



The light between A B has to traverse the ether of A, the ether of B, and a portion of space where the two ethers mingle. Similarly the light between B C. The light between A C has to traverse the ether of A, the ether of C, the combined ethers A B, the combined ethers B C, and the combined ethers A B C. What are the physical characters of those portions of space where the different ethers intermingle? They must obviously differ from the characters of each component ether, for if they did not, then one of the ethers would exclude the other, and the velocity of light would cease to be a function of

the latter in that area ; the result, then, must be that the velocity of light between A C would be expressed by the sum of the following terms:

$$F_A,\ F_C,\ F_{AB},\ F_{BC},\ F_{ABC}$$

Extending now our reasoning to the limits of Mr. Sutcliffe's hypothesis, that each ether fills the whole universe, it follows that there is no portion of space where any of the ethers is absent, and therefore the first four members of the above formula become identical with the last. In less symbolical language, and in general, the velocity of light between any two bodies is a function of the mass, gravity and position of all the bodies of the universe. As such it must be constant, unless Mr. Sutcliffe is prepared to assume (and to prove) that the universe varies in mass and gravity, that is, that matter is being created or destroyed. Of course, position might be pointed out as the varying factor, but as the function would depend on the variations of position of all the celestial bodies, the velocity of light should never be constant in any part of the universe, therefore not on Earth, which is contrary to observation. Thus, the hypothesis of many ethers, each of infinite extent, leads us back to the conclusions of Western science. Things might be different if Mr. Sutcliffe admitted that each ether is of limited extent, in a way similar to the delimitation of the sphere of attraction of each body. But then a new and startling difficulty would

arise, and at present I am busy asking questions and not propounding problems. Mr. Sutcliffe does not admit ethers of limited extent, hence I am not concerned with them. I must remark however that, in his last letter, Mr. Sutcliffe says that the Earth's electromagnetic field (what he called ether before) has a diameter of 100,000,000 light-years, which, though immense, is not infinite.

On the whole, Mr. Sutcliffe's communications are bewildering, and seem full of contradictions, so that it is almost impossible to reason on them. I have shown what consequences flow from some of his assertions; my reasoning may err from want of precise initial knowledge of Mr. Sutcliffe's Eastern science, and it is this knowledge that I would ask him to give to the world, not in vague, misleading, popular phrases, but in strict, technical terms.

G. SCRINZI,

B.A.; D.Sc. (Naples); F.T.C.L.

"The Times of India," Tuesday, September 27th, 1921

V. SCIENCE OF EAST AND WEST

SIR,

My attention has been drawn to Dr. Scrinzi's criticism of my letters on Einstein's theory which appeared in your issue of September 7th; but, owing

to my absence from home, I have not been able to reply to it earlier. Dr. Scrinzi appears to find a difficulty in each of the heavenly bodies having its own electromagnetic field, each extending throughout space, because these fields would necessarily interpenetrate each other; but surely he is aware that the fields of magnets and electrified bodies interpenetrate each other, so that all I claim for these fields of force is what is commonly observed in our physical laboratories. I had pointed out, in your issue of August 12th, that it is probably the interaction of these interpenetrating electromagnetic fields that is the cause of weather changes, and which determines the course of the Indian monsoons. I may here say that the nearest Western approximation to the ether, as understood in the Eastern school, is that of Prof. Stokes (*Philosophical Magazine*, Vol. xxvii, 1845, p. 9), improved by Planck, and further developed by Silberstein in a recent number of *The Philosophical Magazine*.

In your issue of July 23rd I had stated that the radiation velocity of a planet was "definitely related to the mass and position of the planet, just as the velocity of light observed on the earth has a definite relation to the mass and position of the earth in the solar system". In the third letter I gave a concrete illustration of this relationship, where, after showing that the velocity of light is the earth's surface gravity multiplied by the earth's orbital period, I stated that

"the earth's surface gravity, its orbital period, and the velocity of light, are interlinked phenomena, in a way that is unique within the solar system". Now, since the velocity of radiation depends upon the orbital period of the planet, and the planet's orbital period depends upon its mean distance from the sun, that is, upon its position in the solar system, it is quite correct to state that the velocity of radiation is definitely related to the mass and position of the planet in the solar system. From this it will be seen that Dr. Scrinzi's disquisition on the mathematical consequences of the velocity of light being a function of position, is quite beside the mark, and is apparently due to a careless reading of my letters.

As my critic evinces some curiosity as to further facts known in the East but not in the West, I will try to oblige him, but the task would be more encouraging if he exhibited some little appreciation of the facts already given. In my first letter I showed how Eastern methods had enabled us to discover two chemical elements, and publish correct details of them many years before these details were confirmed by Western scientists, but these two incontrovertible facts are completely ignored by Dr. Scrinzi. Moreover, these facts are not given in vague, misleading, popular phrases, but in strict, technical terms, such as he asks for. Scientific criticism does not consist in mere fault-finding, but in an impartial appraisement of the true and the untrue.

However, in order to prove that the Eastern school has scientific knowledge to which the West has not yet attained, I will give a further instance of this, which can immediately be put to the test of exact observations made by Western science. I will give the test fact in the form of a proposition, which is as follows: The ratio of the mean force of terrestrial gravity, and the mean force of terrestrial magnetism, is the square of the velocity of light.

I trust the above will be sufficiently technical to satisfy Dr. Scrinzi. We will now analyse it, and try to imbibe its full meaning. The force of terrestrial gravity is obtained by multiplying the value of the acceleration of gravity at the earth's surface by the square of the earth's radius. This is known as the gravitational mass of the earth. If the whole of the earth's mass were compressed into a sphere of one centimetre in radius, or about the size of a three-quarter-inch steel ball from the wheel of a motor-car, the force of attraction on a unit of mass at the surface of this little ball would be just equal to the earth's gravitational mass, and would be the adopted measure of the gravitational force of the earth. But this would not be the earth's mean gravitational force, referred to in the above proposition; it would be the force at the surface, and what we require is the mean force operating throughout the volume of the sphere. At the centre of the sphere the force would be zero; and, as we measured it along a radius

from the centre to the surface, it would continually increase. If, therefore, we divided the radius into a hundred parts, and measured the force at each division, and then took the average, we should obtain an approximate value of the mean gravitational force. To obtain the exact value we should require to divide the radius into an infinite number of parts, and average. This can be done by means of the calculus, with the result that the mean value throughout the volume of the sphere is exactly three-fourths of the surface value. Thus the mean force of terrestrial gravity is exactly three-fourths the surface acceleration multiplied by the square of the earth's radius.

The mean acceleration of gravity at the earth's surface is 979·75, and three-fourths of this is 734·82. The mean value of the earth's radius is 637,100,000, so that three-fourths the acceleration multiplied by the square of the radius is 2·9826 multiplied by the twentieth power of ten, a number of 21 figures, and such is the mean force of terrestrial gravity in dynes. It is the first of the numbers required to test our theorem. The volume intensity of terrestrial magnetism, as given in Western text-books, is 0·07903, and the mean magnetic force can be obtained from this by multiplying by (4/3) 3·14159, which gives us for the mean force of terrestrial magnetism, 0·33104.

If, therefore, we divide the mean gravitational force, as above given, by 0·33104, and extract the

square root of the quotient, we ought to obtain the observed velocity of light, if the proposition we set out to prove is correct. The value obtained in this way is 30,016,000,000, whilst the value obtained by observation (*Smithsonian Physical Tables*, 1920, p. 414) is 29,986,000,000, a difference of only one part in a thousand, which is not greater than the errors of observation, as every physicist will admit.

I give the above in reply to Dr. Scrinzi's challenge to submit some of my equations for examination, and also to prove that there is knowledge in the Eastern teaching that so far has not been discovered by Western science. The proposition above established is up to now unknown in the West, and it is a fact of revolutionary import, for, along with the facts given in my previous letters, it proves to demonstration that the velocity of light is not a cosmic but a terrestrial phenomenon, and so removes the fundamental postulate of the theory of relativity and that of Einstein.

G. E. SUTCLIFFE

"The Times of India," Thursday, September 29th, 1921.

VI. SCIENCE OF EAST AND WEST

SIR,

Science is as deeply interested in the conclusions reached by Eastern as by Western workers, and

recognises no distinction between them. Mr. Sutcliffe continually draws attention to an "Eastern school" as opposed to a Western. Will he tell us in a few simple words what he means by "Eastern School". It seems to me that so far his Eastern school is using Western methods and figures. If he has discovered a new law bearing on the velocity of light, the Royal Society will be only too pleased to investigate it, as they did Einstein's theory; and he is as entitled to knock the props from under Einstein, as Einstein was to prove that the props of geometry were unsound when classical geometry was extended to space. Classical geometry had successfully explained and given us a working knowledge of the laws of the Solar System, and, as far as is known, of the Universe; Einstein has successfully explained, proved, and predicted some unaccountable small discrepancies which the older geometry had failed to elucidate, and this was a notable advance; so Mr. Sutcliffe will have to do more than write: "The velocity of light is not a cosmic but a terrestrial phenomenon," and so easily dispose of Einstein. He will have to prove it, not only by mathematics but by experiment. The velocity of light, the line by which the depth of the universe has been sounded, has been tested in every way the mind of man has been able to conceive, and found to be constant. The method of transmission is now being re-examined in the light of recent work on ether-waves and electrons, and it

seems as though light is transmitted by both ether waves and electrons, which unites the "undulatory" and "corpuscular" theories. This recent work is so remarkable that Sir William Bragg writes regarding it: "We should perhaps add a new province to the realms of physical thought."

W. S. HOSEASON

"The Times of India," Tuesday, October 11th, 1921.

VII. THE EASTERN SCHOOL

SIR,

The letter from Mr. Hoseason, in your issue of September 29th, calls for some reply from me. He asks me to tell in a few simple words what I mean by the Eastern school. If he asked an authority on relativity to tell him in a few simple words what he means by the theory of relativity, the authority would probably reply that he could not do so. Questions can usually be put briefly, whilst the answer might require a volume. Students in the Eastern school do not in general give information about it until this can be accompanied by something which will command the respect of those to whom the information is given. As a class they are touchy and reserved on the point, and it seems to me that they are as much entitled to

be sensitive on the question of their *Alma Mater* as the proudest graduate of Oxford or Cambridge. I cannot therefore give much more information about the Eastern school, unless I am simultaneously permitted to give proofs that the scientific knowledge of the school is far in advance of that of the West.

After all, the knowledge is the real matter of importance, for it is the knowledge that makes the school, and not the school that makes the knowledge.

With regard to Mr. Hoseason's further suggestion that the Royal Society would be pleased to investigate a new law, I am only speaking from experience when I say that neither the Royal Society nor the scientific journals would be likely to look at, much less investigate, any law which did not emanate from the recognised scientific centres. But it seems to me that the Research Institute of Bangalore, founded by the late Mr. Tata, might perhaps be induced to take an interest in the matter, especially those parts of the new knowledge which promise to throw light on the course of the Indian monsoons.

In reply to the remark that I need to prove my contention not only by mathematics but by experiment, I would say that it is not so much new experiments that are required, but new interpretations of experiments already made. Mr. Hoseason does not appear to have realised that it is the Western, and not the Eastern theories that are contradicted by Western experiments, and both the relativity theory and that

of Einstein are but elaborate contrivances to explain away the obvious teachings of Western experiments.

It may be as well here to set forth once for all the two main differences of the Eastern and Western schools of science. They are both contained in the problem of radiation, which is the rock on which Western science has wrecked its barque. It is the modern riddle of the sphinx which the West has failed to answer correctly. The whole matter will be found in a nutshell in two Reports to the Physical Society of London: one by Prof. Jeans, on the quantum theory (1914), and the other by Prof. Eddington on the relativity theory of gravitation (1918). Prof. Jeans says (p. 2): "The total radiant energy per unit volume of ether in temperature-equilibrium with matter is finite and not infinite."

In the Eastern school, as I have been taught, we say, as against the above: "The total radiant energy per unit volume of ether in temperature-equilibrium with matter is infinite, and not finite." So that here there is point-blank opposite teaching in the two schools. The reply of the West to the sphinxian riddle destroys the laws of Newton, the Eastern reply keeps them intact.

The second diametrically opposite teaching between the East and West is in Einstein's "Principle of Equivalence," which is explained in Eddington's Report above mentioned. Applied to the velocity of light, and put into plain language, it may be expressed

as follows. Although the actual velocity of light may vary widely in relation to different observers, it will always appear constant when measured, because no experiment that can be devised will enable us to detect the actual velocity. As some physicists have put it, the whole properties and forces in nature's mechanism have entered into a conspiracy to tell us lies in connection with the velocity of light. The Eastern teaching, on the contrary, says that there is no such conspiracy on the part of nature to tell us lies, but that the observed velocity of light is the actual velocity, and if our theories will not fit these facts, we must surrender the theorists, but not the facts.

The only alternative to the theory of relativity which will fit the facts is given by Prof. Jeans in the latest edition (1920) of his *Electricity and Magnetism* (p. 619), which he expresses as follows: "The wave-surface formed by the light emitted at any instant will be a sphere having the observer as its centre." This alternative theory I have learnt in the Eastern school, and it accords well with other scientific propositions known in the East, but not in the West, a few of which I give below.

(1) If the earth's astronomical mass be taken as unity, the radiation velocity for other members of the solar system is the velocity of light as observed on the earth, multiplied by the square root of the body's astronomical mass.

(2) The velocity of magnetism for the body is its radiation velocity multiplied by 3·14159, or the ratio of the circumference of a circle to its diameter.

(3) The path of an element of the ether surrounding a body, at a sufficient distance from its surface, is a logarithmic spiral, the tangent of whose constant angle has the value 3·14159.

(4) The volume of ether absorbed by the body in unit time, is the volume of a sphere having the radiation velocity of the body for its radius. In the case of the earth, the volume of ether entering through unit surface in unit time is numerically equal to the electrostatic charge on a gramme of hydrogen, reduced in the ratio of the surface of a sphere to the square of its radius.

(5) The unit of mass from which all the known chemical elements are built up is one-eighteenth of the mass of the hydrogen atom, and this unit of mass, falling on the earth's surface from an infinite distance under the force of the earth's gravitational field, develops an energy equal to the molecular energy of the atmosphere, at the mean temperature of the earth's surface.

Some of the above can be immediately put to the test of numerical calculation, and they are a few of the keys of the inner mechanism of the force of gravity, which is understood in the East though not in the West. The famous dictum, so frequently applied to the truths of religion, will be found

equally applicable to the truths of science: *Ex oriente lux.*

G. E. SUTCLIFFE

"The Times of India," Friday, October 14th. 1921

VIII. THE "EASTERN SCHOOL"

SIR,

I am not going to criticise Mr. Sutcliffe's latest. The impression I receive from his communications is a feeling of bewilderment at the apparent contradictions. What he calls ether one day he calls electro-magnetic field the other; what is finite in one letter is infinite in another. Yet Mr. Sutcliffe will kindly note that I use the word "apparent". It may be, as he remarks, that his theories cannot be explained in a few words, and therefore condensation may cause confusion. But when he says that the scientific bodies and journals of the West refuse to look at anything that does not come from recognised scientific centres, he touches different ground. Some bodies or some journals may be prejudiced, but scientific truth is certain of recognition in the West in general. If the Royal Society has snubbed Mr. Sutcliffe, I beg to remind him that there is Italy and France and Germany on the surface of the earth, where the keenest intellects of each country

will gladly investigate any new thought and proclaim its truth, if it is proved true. The net results of the science of the West are visible all around us, which is a proof that our science is true; it follows that the followers of that science are men of insight, whose aim is to discover truth, without troubling whether it comes from the East or from the West. Mr. Sutcliffe must have seen how suitable are the columns of a daily to the exposition of his theory; let him then submit it to the analysis of trained scientists, and leave the ignorant masses to worry about the consequences of the monsoon without worrying them with its causes.

G. SCRINZI

"The Times of India," Friday, November 18th, 1921

IX. THE VEIL OF ISIS: EASTERN AND WESTERN SCIENCE

SIR,

In your issue of October 14th Dr. Scrinzi finds some contradiction in my reference to the ether of space and the earth's electromagnetic field, which he courteously suggests may be only apparent. Perhaps you will permit me to attempt to clear up the point. The ether of space has been a source of bewilderment to Western science since the age of Descartes, as will

be seen from Whittaker's *History of the Theories of Æther and Electricity* (Longmans, 1910). In my opinion this is due to having confused it with the earth's electromagnetic field. If we throw a stone into a sheet of water, and watch the ripples move away from the disturbance in ever-increasing circles, we have a sectional view of the ether as understood in the West. Sir William Bragg, in the recent Robert Boyle lecture at Oxford (*Nature*, May 19, p. 374), illustrates one of the difficulties of this view of the ether, where he says: "It is as if one dropped a plank into the sea from a height of 100 ft., and found that the spreading ripple was able, after travelling 1,000 miles and becoming infinitesimal in comparison with its original amount, to act upon a wooden ship in such a way that a plank of that ship flew out of its place to a height of 100 ft." Bragg's description of the Western theory of the ether amounts practically to a *reductio ad absurdum*, and it may be well to compare it with the ether as taught in the East. Imagine an enormous bicycle wheel with a large number of thin, hollow, steel spokes, from hub to rim. This may be taken as a rough sectional view of the earth's electromagnetic field. The hub of the wheel is the earth, the spokes are the lines of force constituting the earth's electromagnetic field. Between the spokes is the ether of space, which may be of infinite extent. Each spoke begins on the earth, and ends on a star,

so that the electromagnetic field is finite. As the distance between the spokes increases with the distance from the earth, there is plently of room for lines of force from other planets and suns. The different fields of force can therefore interpenetrate and cut each other. If the force of a falling plank is applied to a line of force at one end, it will be delivered undiminished at the other end, so, that Bragg's difficulty does not apply to the Eastern theory. The number of spokes through unit area will diminish as the distance squared, and the force in the same ratio, but the force applied to an individual spoke will pass to any distance without loss. Vibrations pass along these lines of force according to the undulatory theory of light, whilst corpuscules pass within the hollow tubes in accordance with the corpuscular theory. It is not a question of which is true, the undulatory or corpuscular theories; according to the Eastern school, they are both true. This is now beginning to be recognised in the West, as pointed out by Mr. Hoseason. It is the material corpuscules passing along the light rays which, according to the Eastern theory, accounts for the unexplained motion of Mercury's perihelion, which Einstein calculates but does not explain. In order to calculate this discrepancy of Mercury's motion, Einstein has to distort the whole universe. The Eastern theory requires no such distortion, and the calculation is simple and easy. Physicists appear to

to have lost sight of the fact that attraction between bodies is mutual, so that if matter attracts light, as is proved, then light also attracts matter. The mass of light around the sun, in a sphere having Mercury's distance from the sun for its radius, is of the amount required to cause the observed discrepancy.

The number of lines of force issuing from each square inch of the earth's surface is about thirteen million of millions, and the total number of spokes in the terrestrial wheel requires thirty-two figures to express it. Our sun's surface is 10,000 times that of the earth, and the number of suns forming the stars of our milky way is estimated at one thousand millions. If each of these suns had the same surface as our own, the earth would be able to supply one line of force to each square inch of surface of every star in our siderial system. Our electromagnetic field, therefore, keeps us in excellent telegraphic communication with the heavenly bodies.

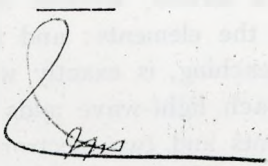
In a portion of one of these lines of force, the length of a light-wave, is hidden some of the deepest mysteries of nature's mechanism. The profoundest problem of physics to-day is the answer to the question: What is a light ray? And when this answer has been given correctly, we shall know the actual mechanism by means of which nature manipulates the forces of gravity, electricity and magnetism. As some knowledge of the contents of a light-wave has

at length percolated into the outer ranks of the Eastern school, I am able to give it out.

It is now known that when the chemical elements are numbered in the order of their weight, from Hydrogen 1, to Uranium 92, it is the number, and not the atomic weight, that determines the chemical properties of the element. If the element number 90 loses an *alpha*-particle (Helium), it loses two atomic numbers, and becomes chemically identical with number 88; if then it loses two *beta*-particles (electrons), it gains two atomic numbers, and again becomes chemically identical with number 90. Thus the loss of one atom of helium and two electrons leaves the element unchanged. Now consider the process reversed. Let one atom Helium and two electrons be given to the element. The Helium will change it from 90 to 92, and the two electrons will change it from 92 to 90, so that here again there is no change. This process can be repeated millions of times a second, without altering the chemical nature of the elements; and this, according to the Eastern teaching, is exactly what the light rays are doing. Each light-wave adds one Helium atom to the elements and two electrons, and, to be able to modify this process, and cause a light ray to add a Helium atom, without simultaneously adding two electrons, is the power to effect the transmutation of the elements, and constitutes the science of Alchemy.

The principle objection to Einstein's theory is that it either denies the existence of the ether of space, or makes it for ever unknowable. The researches of Western scientists are thus repulsed from the field in which the most important secrets of nature are buried. It is the function of science to lift the Veil of Isis, and not to cover the beauty of the goddess with an impenetrable shroud.

G. E. SUTCLIFFE



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